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Patterns in Stock Prices*

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The idea of stock-price patterns is an intriguing one. Any type of pattern in human life that permits even an approximately accurate view of the future has great appeal. Whether there are patterns in stock prices and whether such patterns, if they exist, can be a basis for successfully forecasting stock prices is a decidedly controversial question. In any event, the world seems to be full of persons who (for a fee) are willing to attempt forecasts of stock prices on the basis of what has become known as "internal analysis." Their philosophy is well summed up in the expression, "The ticker tells the story." They believe that probable future price action can be derived from past action. It is fair to say that none of the followers of this philosophy have any notion that there is anything mysterious or occult about this kind of analysis. They believe simply that the fundamental factors of supply and demand can be at least partially measured by examination of past price action, especially when the related volume of transactions is included in the analysis. The literature of these persons or agencies is replete with such expressions as "buying pressure," "selling pressure," "resistence points," "gaps," and "breakouts."

It is not possible to expound this point of view adequately in this article; it is perhaps sufficient to sum it up by saying that there is a belief that there are recognizable patterns in stock prices. Probably most followers of this philosophy recognize that the changing world may interrupt stock-price patterns that might otherwise develop. Indeed, it is quite possible that the changing world is a convenient explanation when stock-price forecasts do not turn out to be accurate. At any rate, even if price patterns exist, it does not necessarily follow that even complete knowledge of such patterns would always lead to successful stock-price forecasting.

Price patterns, if they exist, are clearly not simple recurring movements but are based on many variables. Moreover, they must be related not only to patterns of human response but also to the institutional framework in which markets operate. It is quite possible, for example, that pre-SEC markets resulted in patterns quite different than those of post-SEC markets.

If stock-price patterns are based on human behavior traits, they should be relatively constant. We have previously reported[1] experimental studies aimed at the measurement of investor-speculator behavior under controlled conditions. These studies do not purport to be a complete analysis of investor behavior; much more work needs to be done. Nevertheless, the little that has been discovered at least points to the possibility that typical human behavior patterns may tend to produce patterns in stock prices.

But, even if we knew all about human response to price-making forces, it does not *necessarily* follow that we could successfully forecast stock prices. Price patterns after all have to do with *how* markets decline or rise, not *whether* they will rise or fall. The value-making forces of capital supply, earnings, dividends, and investor expectations undoubtedly govern the direction of stock prices.

Momentum Theory of Stock Prices. Various theories of stock-price behavior may be accurately described as momentum theories or as theories of market inertia. The best known of these is the so-called Dow Theory. This is not the place for a detailed discussion of the Dow Theory; it may perhaps be sufficient to say that it is a device for measuring *in retrospect* when important turning points in the market have occurred. It does not purport to forecast such turning points. The supposed utility of the Dow Theory is related to the momentum of the market; i.e., turning points are identified early enough to be useful in market operation. The Dow Theory is a theory of inertia. It says substantially that the market will continue to move in the direction it is moving until it is brought to rest and reversed, and that after reversal it will continue to move in the new direction for a considerable interval.

It should be emphasized that, under the Dow Theory, turning points are identified only after a lapse of time. The method of identification of turning points involves recognition of three distinct types of market movement:

(1) The primary trend—or long-term trend—usually conforming to business-cycle stages. The primary trend usually persists for several years, as in 1934-37 and 1942-46. It appears to be true that upward movements require a longer time for completion than downward movements.

(2) The secondary trend. Superimposed on the primary trend are shorter cycles of three months' to a year's duration. These shorter cycles within the primary trend may involve fluctuation of from 5 per cent to 15 per cent in value.

(3) Minor or day-to-day fluctuations. These are of no great importance; they are perhaps caused by such transient factors as spot news and correction of temporary over-speculation.

In the Dow philosophy the primary trend is up as long as each secondary cycle produces a peak higher than the preceding one and as long as each trough is higher than the

* Adapted from the following two articles by O. K. Burrell: "Possibility of an Experimental Approach to Investment Studies," *Journal of Finance*, June 1951; "Stock Prices and Probability," *Commercial and Financial Chronicle*, Jan. 3, 1952.

[1] *An Experiment in Speculative Behavior*, Bureau of Business Research, University of Oregon (1950); "A Test of Speculative Behavior," *Commercial and Financial Chronicle*, Mar. 1950; "Experimenting in Investment Studies," *Commercial and Financial Chronicle*, Jan. 11, 1951; "Possibility of an Experimental Approach to Investment Studies," *Journal of Finance*, June 1951.

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last preceding one. When a secondary cycle fails to penetrate a previous level and subsequently falls below a previous level, the primary trend is considered to have been reversed. Conversely, a primary downward movement is considered to have been reversed when a secondary cycle fails to penetrate the previous low and subsequently recovers to a level higher than the peak of the previous secondary cycle.

One of the fundamental assumptions of the Dow Theory is that a reversal of the primary trend is "confirmed" only by similar action in both the industrial and the rail averages.

Can Stock Market Forecasters Forecast? The Cowles Commission for Research in Economics reported in 1933 a study of the record of stock-market forecasters.[2] Included in this study was an analysis of the forecasting record of William Peter Hamilton. Mr. Hamilton, who was the editor of the *Wall Street Journal*, published forecasts of the stock market from 1904 to 1929, inclusive, based on the Dow Theory.[3] These forecasts would have achieved a result better than a normal investment return but poorer than the result of continuous outright investment in representative common stocks for the period. On ninety occasions during the period 1904-1929 Mr. Hamilton announced changes in the outlook for stock prices based on the Dow Theory. Forty-five of these predictions were successful and forty-five were unsuccessful.

In 1944 the Cowles Commission again reported a study of stock-market forecasting.[4] In general this excellent study, which was based on the records of eleven leading financial periodicals from 1927 and over periods from 10 to 15½ years, did not show evidence of ability to predict accurately the course of stock prices. But the record of the forecasting agency with the best record over the 15½-year period from 1927 was considerably better than might be expected from random forecasting. A more detailed analysis was then made of the record of this forecasting agency for the period 1903-1943.

This forecasting agency was not named, but it was indicated that three individuals had been responsible, for varying periods, for the forecasts over the 40-year period. It was also indicated that the general principles followed by the three were similar and that succeeding forecasters were avowed disciples of their predecessors. While the three men never reduced their method to precise mathematical terms, it was generally based on a theory of excess of sequences over reversals, i.e., a theory that main trends persist for considerable periods. The forecasting method of this agency, it was stated, involved an attempt to recognize when the long-term trend of the market had reversed itself. This recognition was not accomplished by any precise statistical test but was based on the general price pattern presented. However, the accuracy of this agency appeared to be definitely related to forecasts that the market would continue to move in the direction in which it had been moving.

While it is not especially relevant for our analysis, it is interesting to speculate as to the identity of this forecasting "agency." The method as well as the time involved certainly suggest Dow-Hamilton-Rhea and the Dow Theory. But the 1933 Cowles study examined the record of Hamilton and found it generally mediocre; and, since the work of Hamilton covered the greater part of the period, it would appear unlikely that the agency studied was this group of Dow theorists. Moreover, Robert Rhea died in 1939 but the Cowles study covered the period to 1943; this might, however, merely indicate that the individual whose forecasts were accepted as following the Dow-Hamilton line was someone other than Rhea. For our purposes it is enough to call attention to the fact that the rather good record of this forecasting agency seemed to be related to the idea of the persistence of general trends.

Monthly Sequences and Reversals. Why should a method based on the excess of sequences over reversals be successful? Obviously, it must be true that in the stock market there are more sequences than reversals. In a penny-tossing series there will be approximately the same number of sequences and reversals; that is, on the basis of pure chance there is a probability of one-half that a reversal (or sequence) will occur. Clearly then price behavior in the stock market is not merely a matter of probability.

The Cowles study quoted an analysis of stock-market sequences and reversals on a monthly basis for the 100-year period 1836-1935.[5] In the total of 1,200 observations there were 748 sequences and 450 reversals. The standard deviation for such a long series on the basis of random penny tossing is 17.3; the deviation of 149 from the expected 599 sequences is in excess of eight times the standard deviation. Analysis indicated also that an average net gain of 6.7 per cent per year exclusive of dividends and brokerage charges would have resulted from an investment policy based solely on monthly sequences over this period.

Volume-Price Change Relations. One of the cherished ideas of students of market structure is that the volume-price change relationship offers a clue to the direction of market movement. According to this credo, when over a period of time a stock declines on large volume but rises on small volume, the direction of price movement is likely to be downward. On the other hand, when over a period of time price increases are associated with large volume and price declines with small volume, an upward price movement is indicated.

We are not underwriting this idea but only reporting it. Probably any market observer would testify that this idea seems to work quite frequently but that it sometimes appears not to work.

It is interesting, however, to attempt to construct a rational hypothesis for this tendency, if such a tendency exists. It is sometimes urged that the relationship results from the greater wisdom of large operators as compared with small operators. This belief would seem to have little to

[2] "Can Stock Market Forecasters Forecast?" *Econometrica*, July 1933. This was a paper read before a joint meeting of the Econometric Society and the American Statistical Association, Dec. 31, 1932.

[3] The "bible" of Dow theorists is Hamilton's *The Stock Market Barometer* (1922).

[4] "Stock Market Forecasting," *Econometrica*, July 1944 and Oct. 1944.

[5] "Some A Posteriori Probabilities in Stock Market Action," Alfred Cowles and Herbert E. Jones, *Econometrica*, July 1937.

support it. It is akin to a belief in a mysterious "they" who put markets up or down. SEC reports of so-called "insider transactions" commonly show "insiders"[6] on both sides of the market in the same month. Moreover, it does not appear that such trading is unusually well timed. As frequently as not, purchases are at peaks and sales at bottoms.

The following hypothesis might be proposed: The volume-price change relationship is a factor which is inherent in the nature of markets. From the nature of markets men seek to sell at the highest possible price and buy at the lowest possible price. At any given moment and for a given price the supply-demand situation may be either weak or strong. If a security sells at 20 and there are 100,000 shares for sale between 20 and 22 but a demand for only 10,000 shares in the range from 20 down to 18, it is evident that the price is more likely to move under 20 than above 20. If buyers' and sellers' price targets were immutable, trading would simply cease. But price targets are not immutable and, as the price fails to advance, an erosion of sellers' expectations occurs. As the price fails to decline to buyers' targets, an upward adjustment of these bids occurs. Not all buyers and sellers participate in this adjustment process but, except in inactive securities, enough do participate to produce what may be called an equilibrium price which reflects the demand-supply relationship. In the case mentioned, this equilibrium price would be closer to 18 than to 20. We are here postulating that, at any given moment, there is an equilibrium price which reflects the current demand-supply relationship. But this equilibrium price is not necessarily the market price. Differences in bargaining skill as well as luck may result in a market price temporarily above or below this equilibrium level. A market order to buy, for example, may serve to push the price at least temporarily above the equilibrium. When the price is above the equilibrium level the volume will be heaviest on declines and lightest on increases. This is because, at the given level, there is more stock for sale than available bids. When the price is below the equilibrium level, heavy volume will generally accompany increases in price and light volume decreases in price.

This hypothesis does not imply that the volume-price change relationship will always point the direction of price change. Equilibrium prices do not remain constant, for the simple reason that the world changes. The volume-price change relationship, for example, may indicate that a particular stock price is above equilibrium and therefore likely to fall. But a rise rather than a decline may occur if there is a change in the world that improves investor expectations and thus revises the equilibrium price upward. Such a factor might be a brilliant earning report, a change in the money market, or any other event that might conceivably modify investor expectations.

Experimental Validation of Volume-Price Change Relationship. It is quite possible to test this hypothesis by the experimental method. We have previously published the results of such an experimental study.[7] This study (which was concerned only incidently with examining the hypothesis of the volume-price change relationship) involved the setting up of an artificial market situation. There were forty participants in the experimental group and each participant was given an instruction card which covered buying and/or selling directions. They were instructed to buy or sell at the most advantageous price not inconsistent with individual instruction cards. They were also required, of course, not to show instruction cards to others.

Some of the participants (with selling instructions) were directed not to enter the market until midway in the trading period. Very simple trading rules were established and prices and volume were recorded as trading progressed. The demand-supply schedules were arranged in such a way as to yield an equilibrium price of 40 in the first half of the trading period and an equilibrium price of 33 in the last half of the trading period.

In order to test the hypothesis of the volume-price change relationship, data were set up on a cumulative basis with plus-and-minus increments consisting of the product of the price change and the volume of trading. This volume-price change indicator did not, in the first half of the trading period, point to the impending change in equilibrium price. Indeed, there was no reason why it should have done so. The impending shift in the supply curve which was to produce the lower equilibrium price was similar to a change in the world. None of the participants had any knowledge of the impending change in the supply curve.

In the second half of the trading period the observed prices responded very sluggishly to the changed supply curve. Approximately half of the trading in the second half of the period was in the range 37-40 as compared with an equilibrium price of 33. While the force of additional supply ultimately brought the price to and below equilibrium, the memory of previous prices nevertheless seemed to exert some gravitational pull on subsequent prices.[8]

During the second half of the trading period, as long as the observed prices were above the equilibrium level, the volume-price change index was strongly negative (heavy volume associated with price declines and light volume with price increases). But when observed prices declined below equilibrium, this index pointed upward.

Within the limits of the sample and the experimental design, then, our hypothesis concerning the volume-price change relationship appears to have been verified. It must be remembered, however, that this hypothesis was a very limited one and postulated only that the volume-price change relationship might reveal situations where the actual price is above or below the equilibrium price. In real markets it is quite likely that most price changes are in response to changes in the world and not mere adjustment of quoted prices to the reality of demand-supply schedules. If this is true, the volume-price change index might be only rarely useful in judging market prices.

[6] An "insider" is an officer or director or one who is the beneficial owner of more than 10 per cent of the stock. SEC regulations require reports of trading by such persons.

[7] *Journal of Finance, op. cit.*

[8] The effect or bias of the initial price is also suggested in an experiment reported by Edward H. Chamberlain, "An Experimental Imperfect Market," *Journal of Political Economy*, Apr. 1948.

Current Business Trends in Oregon

Lumber. The January 1952 production of lumber in the Pacific Northwest Douglas-fir industry was slightly below last year, but orders were higher than production. The most recent monthly statistics for the industry prepared by the West Coast Lumbermen's Association are as follows (thousands of feet, board measure):

	Jan. 1952	*Dec. 1951*	*Jan. 1951*
Average weekly production	174,752	168,159	203,130
Average weekly orders	199,511	174,104	242,660
Average weekly shipments	164,555	156,471	210,795
Unfilled orders, end of month	1,064,724	903,925	1,024,954
Gross stocks, end of month	1,006,625	959,718	759,479

CURRENT BUSINESS TRENDS IN OREGON

Portland Department-Store Sales. Portland department-store sales continue to show an unfavorable comparison with a year ago. Although this situation is general in all Pacific Coast cities except San Francisco, the decline from a year ago is somewhat greater than the national average. The figures below show the most recent changes in Portland and other Pacific Coast cities.

	Week Ending Feb. 9, 1952	*4 Weeks Ending Feb. 9, 1952*	*Calendar Year to Feb. 9, 1952*
Portland	—15	—14	—19
Los Angeles	—11	—17	—16
San Diego	—15	— 9	—14
Oakland	—10	—13	—14
San Francisco	— 7	0	0
Seattle	—15	—10	—13
Spokane	—16	—13	—13
United States	— 8	— 9	—12

The total sales for December 1951 were somewhat disappointing, the seasonally adjusted index number being 101 (1947-49=100). The similarly adjusted index reading for November was 106, and for December 1950 was 104.

The dollar sales of Portland apparel stores were 9 per cent less in December 1951 than in December 1950, but the sales for the calendar year 1951 were the same as for 1950. The December decline was concentrated in men's clothing, possibly because of the clerk's strike, as is shown in the following year to year comparison of sales.

	December	*Calendar Year*
Men's clothing	—22	— 8
Women's clothing	— 1	+ 4
Total	— 9	0

Employment. Declines in Oregon's seasonal industries have resulted in a decrease of more than 50,000 nonfarm workers since September 1951, according to the State Unemployment Compensation Commission. This brought January 1952 employment to about 424,000, which is considerably below that of December (447,800) but almost as high as January 1951 (426,400). Preliminary February figures indicate some improvement. The loss since the fall peak includes the following major reductions of employment: logging and lumbering, 18,000; food processing, 12,000; construction, 9,000; retail trade, 4,000; and service, 3,000. Most of these declines were of a normal seasonal nature, but the closing of several canneries usually open at this time of the year has reduced employment unseasonably in some coastal towns.

On January 26, 1952, the number of persons receiving unemployment compensation benefits in Oregon totaled 28,331. The largest number of these individuals (13,532) were normally employed by the logging and lumbering industry, and the second largest number (4,343) were normally employed by the construction industry. The distribution of the claimants by cities was: Portland, 6,671; Salem, 2,413; Eugene, 2,277; Medford, 1,685; Hillsboro, 1,446; Astoria, 1,295; other communities, 12,544.

Multnomah County Real-Estate Transactions. During January 1952 there were 994 actual real-estate sales amounting to $8,162,192 in Multnomah County. Of these, 734 involved residences, the total sale price of which was $6,706,135; 229 were vacant properties, $343,767; and 31 were business properties, $1,112,290. Additional figures are:

	Jan. 1952	*Dec. 1951*	*Jan. 1951*
Number of sales	994	859	1,184
Value of sales	$8,162,192	$8,042,098	$9,937,471
Number of mortgages	927	873	1,037
Amount loaned	$5,246,916	$7,128,820	$6,756,915
Average residential sales price	$9,136	$9,144	.....

Motor-Fuel Sales. During December 1951 motor-vehicle fuel sales in Oregon totaled 39.1 million gallons. This compares with 40.9 million in November and 39.8 million in December 1950.

BANK DEBITS

Bank debits represent the dollar value of the checks drawn against individual deposits. Payment for approximately 90 per cent of all goods, property, and services is by check. Bank debits are regarded as indicators of the general trend of business, though their value for this purpose may be impaired by substantial changes in the level of prices. The Bureau of Business Research collects bank debits from 122 banks and branches monthly. On occasion, the totals for the same month in different issues of the *Review* are not directly comparable because of necessary adjustments in basic data.

Marketing Districts	*Number of Banks Reporting*	*Debits Dec. 1951*	*Debits Nov. 1951*	*Debits Dec. 1950*	*Dec. 1951 Compared with Nov. 1951*	*Dec. 1951 Compared with Dec. 1950*
Oregon	114	$1,325,651,691	$1,311,825,432	$1,229,875,724	+ 1.1	+ 7.8
Portland (Portland, Hillsboro, Oregon City, etc.)	33	858,999,061	832,700,036	778,197,352	+ 3.2	+10.4
Lower Willamette Valley (Salem, McMinnville, etc.)	15	86,917,475	95,451,972	87,558,196	— 8.9	— .7
Upper Willamette Valley (Albany, Corvallis, Eugene, etc.)	16	125,503,804	120,648,545	115,607,648	+ 1.5	+ 6.0
North Oregon Coast (Astoria, Tillamook, etc.)	4	22,598,629	20,807,141	19,622,524	+ 8.6	+15.2
Douglas, Coos Bay	7	40,670,486	36,271,016	40,336,136	+12.1	+ .8
Southern Oregon (Ashland, Medford, Grants Pass)	6	49,735,124	54,071,572	49,126,632	— 8.0	+ 1.2
Upper Columbia River (The Dalles, Hood River, etc.)	7	22,822,155	23,133,563	24,027,748	— 1.3	— 5.0
Pendleton area	6	27,201,688	27,613,036	22,806,024	— 1.5	+19.3
Central Oregon (Bend, Prineville, Redmond)	5	22,465,117	25,056,928	23,547,947	—10.3	— 4.6
Klamath Falls, Lakeview area	5	31,031,676	34,997,465	32,897,202	—11.3	— 5.7
Baker, La Grande area	5	16,008,768	17,388,899	14,843,634	— 7.9	+ 7.8
Burns, Ontario, Nyssa	5	21,697,708	23,685,259	21,324,681	— 8.4	+ 1.7

BUILDING PERMITS

Building permits give an indication of building operations planned rather than actual construction under way. Care must be taken, in interpreting these data, to allow for the lag which may elapse between the issuance of the permit and the beginning of actual construction. The data have been collected by the Bureau of Business Research.

	New Residential Dec. 1951	*New Non-residential Dec. 1951*	*Additions, Alterations & Repairs Dec. 1951*	*Totals Dec. 1951*	*Totals Nov. 1951*	*Totals Dec. 1950*
Astoria	$ 13,760	$ 1,300	$ 12,434	$ 27,494	$ 15,282	$ 9,595
Baker	.....	2,500	2,300	4,800	24,800	7,838
Bend	7,000	1,000	4,200	12,200	45,940	42,285
Coos Bay	10,000	20,000	2,825	32,825	64,065	184,077
Corvallis	44,800	1,400	13,205	59,405	79,735	40,070
Eugene	152,500	15,700	14,282	182,482	172,673	212,160
Grants Pass	35,190	25,970	2,675	63,835	123,346	152,302
La Grande	.....	550	600	1,150	13,965	5,350
Medford	43,000	2,645	15,690	61,335	196,495	60,950
North Bend	19,000	6,650	8,515	34,165	35,165	38,750
Oregon City	.....	.....	500	500	17,750	47,150
Pendleton	18,000	33,275	19,600	70,875	42,200	50,514
Portland	906,605	2,374,780	380,230	3,661,615	1,672,770	2,853,155
Roseburg	8,000	75	11,575	19,650	50,630	26,346
Springfield	105,000	3,500	4,750	113,250	74,450	162,070
The Dalles	57,750	21,750	4,800	84,300	185,175	104,005
17 other communities	243,950	15,995	75,925	335,870	329,330	139,226
Total	$1,664,555	$2,527,090	$ 574,106	$4,765,751	$3,143,771	$4,135,843